AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior listings, and all prior versions, of claims in the application.

Listing of Claims

1. (currently amended) An AC motor control apparatus comprising a controller which sends a control signal to an inverter which supplies arbitrary AC power to an AC motor, said controller comprising:

a ripple current generator for supplying a ripple current to said AC motor; and

a magnetic pole position estimator,

wherein said ripple current generator outputs a voltage command V_{hd}*, and

wherein said magnetic pole position estimator ~~observes at least two current values of said ripple current for both positive and negative sides of said ripple current~~ receives said voltage command V_{hd}*, an exciting current component I_{dc} of a motor current, and a torque current component I_{qc} of said motor current as input, and said magnetic pole position estimator outputs a position error $\Delta\Theta$ to estimate the magnetic pole position of said AC motor.

2. (original) The AC motor control apparatus according to claim 1, wherein said magnetic pole position estimator obtains a current variation rate, based on said at least two current values, to estimate the magnetic pole position of said AC motor, based on said current variation rate.

3. (original) The AC motor control apparatus according to claim 1, wherein said ripple current generator outputs a rectangular waveform voltage as a voltage command.

4. (original) The AC motor control apparatus according to claim 3, wherein said inverter performs pulse width modulation using a carrier and said rectangular waveform voltage has a pulse period that is four times or greater even integral times a waveform period of the carrier.

5. (original) The AC motor control apparatus according to claim 1, wherein said ripple current generator outputs a stepwise waveform voltage as the voltage command.

6. (original) The AC motor control apparatus according to claim 5, wherein said inverter performs pulse width modulation using a carrier and said stepwise waveform voltage has a pulse period that is four times or greater even integral times a waveform period of the carrier.

7. (original) The AC motor control apparatus according to claim 1, further comprising a current amplitude difference calculator for setting or changing the amplitude of the voltage to be applied.

8. (original) The AC motor control apparatus according to claim 2, wherein said ripple current generator adjusts the amplitude of a voltage as

the voltage command so that the current variation rate of said ripple current falls within a predetermined range.

9. (original) The AC motor control apparatus according to claim 1, wherein said magnetic pole position estimator for estimating the magnetic pole position inside said motor starts operation after performing a fault detection process to check for a fault in said inverter and said controller.

10. (currently amended) An AC motor control apparatus comprising a controller which sends a control signal to an inverter which supplies arbitrary AC power to an AC motor, said controller comprising:

a ripple current generator for supplying a ripple current to said AC motor; and

a magnetic pole position estimator,

wherein said ripple current generator ~~supplies~~ outputs rectangular waveform voltages with different amplitudes in sequence as a voltage command V_{hd}^* and said magnetic pole position estimator ~~observes at least one current value of said ripple current for both positive and negative sides of said ripple current~~ receives said voltage command V_{hd}^*, an exciting current component I_{dc} of a motor current, and a torque current component I_{qc} of said motor current as input, and said magnetic pole position estimator outputs a position error $\Delta\Theta$ to estimate the magnetic pole position of said AC motor.

11. (original) The AC motor control apparatus according to claim 10, wherein said magnetic pole position estimator obtains a current variation rate, based on said at least one current value, to estimate the magnetic pole position of said AC motor, based on said current variation rate.

12. (original) The AC motor control apparatus according to claim 10, wherein said inverter performs pulse width modulation using a carrier and said rectangular waveform voltages with different amplitudes have a pulse period that is two times or greater integral times a waveform period of the carrier.

13. (currently amended) The AC motor control apparatus according to claim ~~10~~11, wherein observing at least one current value of said ripple current is observing only around positive and negative peaks of said ripple current.

14. (original) The AC motor control apparatus according to claim 1, wherein said ripple current is applied along two or more arbitrary phase axes.

15. (original) The AC motor control apparatus according to claim 10, wherein two rectangular waveform voltages with different amplitudes are applied for a predetermined period alternately along a dc axis that is a magnetic pole axis estimated by the controller and along a qc axis perpendicular to the dc axis.

16. (original) The AC motor control apparatus according to claim 15, wherein said two rectangular waveform voltages with different amplitudes are distinguished as a first rectangular waveform voltage and a second rectangular waveform voltage, a period during which said first rectangular waveform voltage is applied along said dc axis is denoted by d1, a period during which said second rectangular waveform voltage is applied along said dc axis is denoted by d2, a period during which said first rectangular waveform voltage is applied along said qc axis is denoted by q1, a period during which said second rectangular waveform voltage is applied along said qc axis is denoted by q2, and the voltages are applied in sequence of said period d1, said period d2, said period q1, and said period q2 or in sequence of said period d1, said period q1, said period d2, and said period q2.

17. (original) The AC motor control apparatus according to claim 10, further comprising a current amplitude difference calculator for setting or changing the amplitude of the voltage to be applied.

18. (original) The AC motor control apparatus according to claim 10, wherein said ripple current generator adjusts the amplitude of a voltage as the voltage command so that the current variation rate of said ripple current falls within a predetermined range.

19. (original) The AC motor control apparatus according to claim 10, wherein said magnetic pole position estimator to estimate the magnetic pole position inside said motor starts operation after performing a fault detection process to check for a fault in said inverter and said controller.

20. (currently amended) An AC motor control apparatus comprising a controller which sends a control signal to an inverter which supplies arbitrary AC power to an AC motor, said controller comprising:

a ripple current generator for supplying a ripple current to said AC motor; and

a magnetic pole position estimator,

wherein said ripple current generator ~~applies~~ outputs a stepwise waveform voltage as the voltage command V_{hd}^* or ~~applies~~ outputs rectangular waveform voltages with different amplitudes in sequence as a voltage command V_{hd}^* and said magnetic pole position estimator ~~estimates~~ receives said voltage command V_{hd}^*, an exciting current component I_{dc} of motor current, and a torque current component I_{qc} of said motor current as input, and said magnetic pole position estimator outputs a position error $\Delta\Theta$ to estimate the magnetic pole position of said AC motor.